

ABOVE SDT Meeting – 5/2/13 to 5/3/13

Attendees: Natalie Boelman, Steve Colt, Joshua Fisher, Scott Goetz, Peter Griffith, Guido Grosse, Forrest Hall, Bob Harriss, Dan Hayes, Dan Hodkinson, Jeremy Karchut, Eric Kasischke, Libby Larson, Michelle Mack, Dave McGuire, Juha Metsaranta, Chip Miller, Mike Rawlins, Colm Sweeney, Rob Striegl, Matthew Sturm, Diane Wickland, Stan Wullschleger; Rapporteur: Elizabeth Hoy

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Session I – Thursday Afternoon, 5/2/13

Initial Discussion

Diane W. opened the meeting with a discussion of the guideposts and past work that has been done to form the ABoVE campaign and gave the SDT the charge to begin developing the ABoVE Concise Experiment Plan (ACEP) based on that past work. An initial discussion included potential issues identified by the SDT members including:

- Scaling data and datasets from multiple spatial and temporal scales
 - Using modeling to scale measurements to the regional and pan-arctic level
- Determining appropriate measurements and the number of sites needed to understand change
- Revisiting the work of FIFE and BOREAS and leverage the understanding from these programs
- Assembling historical maps and datasheets of past research
- Understanding NEON's approach to site selection which used GIS and statistical sampling
 - Leveraging existing sites/networks if possible, such as LTER, NEON, Yukon River research, NGEE
- Assessing the usefulness of the IPCC AR5's climate models for ABoVE modeling and forecasting
 - Also consider the National Climate Assessment
- Considering space for time substitution as part of the ACEP methodology to determine how processes are changing

Sum up: The ABoVE SDT should make an effort to understand pre-ABoVE work within the region and investigate models of the area, such as pre-ABoVE modeling of the region (Dan Hayes)

Members of the SDT identified many issues surrounding human dimensions of change and raised several issues for ABoVE to address:

- Understanding gradients and ecosystem processes impacting the livelihood and cultural resources of people
- Understanding impacts to both society and ecosystems (these impacts are not mutually exclusive)
- Addressing the give and take between economic opportunities and tribal identity
- Understanding variability in landscapes used by humans, as the ability of people to use the landscape is much less predictable (i.e. – sea ice) and traditional ways of understanding the land have changed
 - The transition from nomadic to fixed lifestyles has drastically impacted these populations
- Alaska Native Center for Climate and Health has reports of how ecosystem changes are affecting native populations
- Population differences exist between coastal communities and mining communities
- Adaptability of these native communities is important to understand
- The Alaska Native Science Commission is addressing issues of climate change and the effects on ecosystem; contacts are Patricia Cochran and S. Huntington

Synthesis / Analysis of the “Big Thing” Discussion

Eric K. presented a powerpoint including a breakdown of “big things” and a potential flow diagram for the group to discuss; different sections of the diagram are discussed below:

Discussion: Drivers of change

- Climate can be an external driver to the system
- Need to understand regional scale impacts
- Hydrologic behavior such as the thawing and drying of lakes, surface moisture and climate/precipitation
- Fire disturbance
- Winter processes are important too, such as snow and ice distribution, runoff patterns, winter precipitation and spring warming
- Novel introduction of plant/animal functional types as a driver of change (such as trees moving into tundra or lodgepole pine into Alaska from the Yukon)
- Methods are needed to understand climate changes to the landscape such as lakes becoming drier or wetter, vegetation browning or greening
- Understanding large scale shifts, not just internal shifts
 - Systematic shifts/biome shifts are occurring, changes in composition are occurring
- Changes in seasonality are important. Timing is important and trophic mismatches can occur
- Human changes in the system
 - Black carbon deposition onto snow and contamination by other pollutants
 - Shipping activity
 - Tar sands mining and oil exploration

Discussion: Responses to Change and General Discussion

- Understanding changes to the distribution and abundance of biodiversity including non-vascular species (mosses and lichens are sensitive to change) is important
- Functional redundancy could be occurring for tundra species with a changing climate
- Understanding responses to microbes and soil nutrient dynamics associated with biodiversity is important
- Temporal scale issues should be considered as the ACEP is crafted – inter-annual to decadal climate change
 - For example, changes in global circulation patterns (such the arctic oscillation) can change snow patterns and will affect the ABoVE study from year to year
 - Spatial scale issues including the transport of pollutants from temperate areas to the arctic could be important too
- Ecosystem services could be sensitive to change. Overview of ecosystem services:
 - Provisioning ecosystem services: things that can be harvested across the landscape (trees, salmon, etc.)
 - Regulation services – such as climate regulation (carbon dioxide, methane, and albedo feedbacks). Hydrologic regulation and flood prevention factors into this too.
 - Cultural and recreational services

- Vulnerability to pests and disease should be considered as a response to change
- Issues normally seen south of the ABoVE study region could be migrating north with a changing climate
- Economic development of coastal regions could be a response to change
- The Arctic Council is looking at scenarios with climate change – shipping scenarios, etc.
 - Diane W. – ABoVE could respond to what those scenarios might mean.
- Availability of traditional foods might be an issue for native people, but these groups may not have thought to consider this as related to climate change
- Ecosystem services change when the “map” changes. There are maps or landscapes of the current situation in the arctic such as vegetation composition, sea ice or permafrost subsidence, animals etc. and these “maps” will change with changes to the system

Discussion: Impacts on Society

- Society’s response (and economic development) can alter the environmental situation making it “better” or “worse”, such as with oil and gas exploration or the management of natural areas
- Contaminants/pollution can be an issue, including mercury
 - The economies of southeast Asia are driving some of this contamination
- Infrastructure vulnerability is an issue (consider permafrost thaw)
 - Land management may address this issue
- Dave M. provided informative slides on societal issues identified by the LCCs
 - Land managers could be important stakeholders in ABoVE
 - As a group we need to see how land managers fit – possibly meet with this group at the July SDT
- Arcticnet is a Canadian project with a focus on northern communities. Their summary might help us focus in on areas of study. Louis Fortier is in charge. <http://www.arcticnet.ulaval.ca/>
 - Juha M. will look into societal impacts in Canada
- It is important for ABoVE to establish baselines and key variables (such as sea ice) in order to document change
 - Other key variables: surface moisture, vegetation cover, the freeze-thaw cycle and other seasonal components of the system
 - NSIDC can be used to determine the current state of sea ice
 - Changes in fire disturbance patterns should also be documented
 - While it is important to document change, ABoVE should also focus on understanding changes, through looking at the indicators of change (Diane W.)
- Subsistence harvest data is not currently collected, this represents a gap in the arctic observing network
 - The SLiCA survey of living conditions in the arctic was only administered once, but can provide a wealth of data: <http://www.arcticlivingconditions.org/>
- As a group we need to determine which human-environment interactions should be a part of ABoVE and at what scale these issues should be addressed (Eric K.)

Session II – Friday Morning, 5/3/13

Synthesis from Day 1

The day started with a discussion of the potential diagram that the SDT had created during Session 1. The team made changes to the diagram as appropriate. Below are a few highlights from the discussion:

- Call this diagram the vulnerability framework; vulnerability is really the exposure and resilience of the system
 - Vulnerable communities could be at risk, but they could also be very resilient. Incorporating both words into the final document may be helpful in explaining changes to others.
- The distinctions between landscapes and ecosystems needs to be clear, as different groups define these terms differently
 - Perhaps both words can be incorporated in the final plan (Diane W.)
- Scale is important; consider seasonal, annual and decadal time scales as a driver to this system. Both weather and long-term climate issues should be important in ABoVE.
 - The University of Washington is conducting weather and climate studies which could be utilized by ABoVE
 - Atlantic ocean oscillations could be important to this system too
 - The temporal domain of ABoVE may need to be defined just as the spatial domain is being defined (Dan Hayes)
 - Stommel diagrams offer a useful way to analyze data
 - Scaling Studies in Arctic System Science and Policy Support: A Call-to-Research (http://www.arctic.gov/publications/arctic_scaling.html) by the Arctic Research Commission is a useful document (Dave M. worked on this report)
- An overarching question was developed by the group: “How vulnerable and resilient are ecosystems and society to environmental change in arctic and boreal regions?”

Discussion of the ABoVE Science Questions

Following a short break, the SDT began discussing the science questions identified in the ABoVE Scoping Study and the Workshop Report. A review of the development of these questions was given, and Diane W. charged the group with improving/approving these questions.

After an initial discussion of the questions in which SDT members considered the relationship of the questions to one another, the group attempted to associate the 4 science questions with the Vulnerability Framework. This exercise resulted in the following questions associated with the Vulnerability Framework:

1. In what ways are ecosystems changing?
2. Why are ecosystems changing?
3. How are ecosystem services affected?
4. How is society responding to changes?

Topics associated with each question were then discussed. Highlights are included below:

1. In what ways are ecosystems changing? Topics addressed included:

- Baseline datasets are needed
- Rates and trajectories of change need to be calculated
- Both structural and functional aspects of change should be considered
- While understanding change is important, it is equally important to understand the drivers of change as well
- Spatial and temporal scales could be changing
- Modes of change should be considered – gradual or threshold changes; one-way change (such as permafrost thaw) or variable change

2. Why are ecosystems changing? Topics addressed included:

- Ecosystem resilience and vulnerability
- External drivers and internal feedbacks
- Physical, chemical and biological drivers
- Natural and anthropogenic influences
- Pressure and pulse disturbance
- Feedbacks from changing ecosystem services (such as the affect of ecosystems on hydrology)

3. How are ecosystem services affected? Topics addressed included:

- ABoVE should investigate which changes have the greatest effect on the system
- Some changes could have positive impacts (such as agriculture or berry harvesting)
- Traditional ecosystem services should also be considered (air quality, water quality, climate regulation)
- New or emergent ecosystem services as a function of change should be included in ABoVE (navigation, increased fisheries, tourism)
- A spatial redistribution of services/amenities is also possible (local communities could have more beneficial services but the region as a whole might see negative impacts)
- Scale is an important consideration here

4. How is society responding? Topics addressed included:

- Risk assessment
- Adaptation and mitigation
- Scale is important in considering the response of society:
 - Spatial scale – local people and larger global population
 - Temporal scale – short term changes could include (for example) decreases in salmon population and greater berry harvests, while long term changes could include human population shifts
- Type of responses are important too – individual vs. institutional responses

- Population patterns of local residents could change due to environmental, economic and policy changes (increases in energy prices, changes in ice roads, impacts on human health, food consumption, livelihood changes)
- The relationship between responses at the local level and the regional level needs to be better understood. Highlighting these responses could shape public perception

Session III – Friday Afternoon, 5/3/13

Past Field Campaigns and ABoVE Q and A

Following the lunch break, the SDT heard a presentation by Peter G. discussing NASA’s process in conducting a past field campaign, LBA-Eco. This was followed by a discussion of the SDT. Highlights are included below:

- Peter G. presented an “Overarching Results of LBA” slide which many of the SDT found helpful. The hope was that ABoVE would craft an experiment plan that would lead to similar overarching results.
- Reviewing lessons learned from past campaigns is important in moving forward with ABoVE and efforts should be made to locate the BOREAS experiment plan

Next, Diane W. gave a presentation on the notional outline for the ACEP. This outline is included at the end of this document. A question and answer regarding the specifics of the ACEP outline and related topics followed:

- Q: How long will the ACEP be? A: 20-50 pages
- Q: What will the solicitation process look like? A: An NSPIRES call will be issued and will most likely cite the ACEP. Most likely, 3 yr cycles for researchers will be included, and possibly 4-5 yr cycles based on the needs of the campaign.
- Q: How should scientific partnerships be addressed in the ACEP? A: Current partnerships should be described in the ACEP, and a discussion of hopes for future partnerships should be included. This would include a discussion of how to scientifically integrate partnerships into research, not the mechanisms for making partnerships per se. Discussions with NGEE could be included in this chapter of the ACEP.

Discussion of ABoVE Themes and Ecosystem Services

Next followed a discussion of how to begin the process to frame and craft the ACEP. Highlights of the discussion include:

- ABoVE themes: While the scoping study includes a number of themes, the SDT should further develop these themes and ensure crosscutting issues are included (Eric K.)
- Ecosystem services are an important part of what ABoVE should address and time was spent discussing this issue:
 - The LCCs have identified a number of ecosystem services including: fish and wildlife impacts, wildlife diseases and invasive species, climate regulation, protection of trust species, biological carbon sequestration, wildland fire impacts, water availability and

- quality, sea ice and glacier loss, ecosystem resilience and restoration, cultural resources and subsistence issues, sea level rise and coastal storm impacts, mineral extraction and exploration, energy resources, transportation and infrastructure, tourism
 - Other ecosystem services could include issues such as coastal marshlands providing buffering against sea level rise
 - Collins et al. (2011) provides a conceptual framework of socio-ecological issues which could be altered to fit the ABoVE study region
 - Four types of ecosystem services are noted in Collins et al. (2011) which could be utilized in ACEP: regulating, provisioning, cultural and supporting. ABoVE should focus on the services that are most important/vulnerable and most likely to be affected by current changes in the arctic.
 - Ecosystem services in each of the 4 categories defined by Collins et al. (2011) were identified including:
 - Provisioning – moose, salmon, berries, firewood, subsistence resources
 - Regulating – water quality, etc.
 - Supporting – permafrost and ice as structural entities for transportation, etc.
 - Cultural – subsistence activities
 - The Millennium Ecosystem Assessment includes a list of ecosystem services the SDT may want to investigate
- One common theme could be soil carbon as a regulating service. This includes issues associated with permafrost thaw and disturbance.

Meeting Wrap-Up

Some of the SDT volunteered to begin developing a strawman field plan for discussion at the next SDT however it was decided to hold off on this action item until the goals and objectives of ABoVE are further refined.

Peter G. detailed some of the work currently within the program office to catalog and eventually display GIS layers useful to the SDT within a web-based mapping server. A small group was formed to continue this discussion prior to the July meeting (members include Stan W., Colm S., Jeremy K., Chip M., Josh F., Guido G., Rob S., Matt S. and Peter G.).

The SDT self-organized into small groups focused on different aspects of the Vulnerability Framework to begin discussing various aspects of the plan:

- Box 1: Natalie, Scott, Michelle, Chip
- Box 2: Libby, Dave, Juha
- Box 3: Steve, Jeremy, Matt
- Box 4: Eric, Forrest, Guido, Josh, Mike

It was brought forward that at the July SDT meeting, the SDT will need to begin discussing study design. The SDT was tasked with 2 homework assignments in order to provide Dan Hayes and Eric K. text with which to begin crafting chapters 1 and 2 of the ACEP prior to the July SDT meeting.

Action Items

- SDT Homework Assignment: Continue the “big thing” discussion in terms of the vulnerability framework. Write up a 1 paragraph discussing the main science questions.
- SDT Small Group Homework Assignment: The 4 groups representing different boxes within the Vulnerability Framework should provide Dan with bullet points about their topic so that Dan Hayes and Eric K. can craft prose for Chapters 1 and 2 prior to the July SDT meeting
- Schedule 2 additional telecons prior to the July SDT meeting

Appendices:

Notional Outline for ABoVE Concise Experimental Plan (Short Version)

1. Introduction
 2. Science Question(s)
 3. Second tier science questions or themes for ABoVE
 4. Overall Research Approach / Strategy (Top-level description of how we will address the ABoVE questions)
 5. Research approach by science question / theme (optional?? Or combine with #3. above
→ It is possible we might want to have a chapter here to roll up / integrate the “requirements” that come out in each of the science question / theme sections above
 6. Role of Remote Sensing (or could be so well integrated in the sections above it is unnecessary)
 7. Scientific interactions and partnerships with other projects, studies, organizations (OR could be folded into implementation section below)
 8. Implementation Strategy / Top-level Requirements
 9. Concluding Chapter (optional?)
- References
- Appendices (optional)

Research Framework for ABoVE.

